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LOCKHEED MARTIN

Via Facsimile &
U.S. Mail
CAY0399/133

March 17, 1999

Mr. Gerald J. Thibeault
Executive Officer
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Subject: **Quarterly Report – December 1998 through February 1999**
Cleanup and Abatement Order No. 97-58
Order Item 1
Lockheed Martin Corporation

Dear Mr. Thibeault:

This Quarterly Report is for the quarter including the months of December 1998, January, and February 1999. The report is submitted in accordance with Board Order No. 97-58 and the approved 15 August 1997 Workplan and Schedule. This update summarizes activities accomplished this quarter organized by each major work task presented in the 15 August 1997 Workplan.

1.0 Perchlorate Sampling

Technical data on perchlorate, associated with the regular Water Supply Contingency Policy sampling, was submitted to the RWQCB under separate cover in December '98, January and February '99. The reports are entitled, "Production Well Sampling Report, Water Supply Contingency Plan, Crafton-Redlands Plume Project."

2.0 Additional Monitoring Wells Proposed for the Leading Edge Area

A meeting was held between Lockheed Martin Corporation and the Regional Board on January 27, 1999. Discussion included a presentation of Plume characterization status and future characterization activity. Location of a new monitoring well for completion of plume characterization activity was requested by the Regional Board and logistics were reviewed.

3.0 Modeling of Perchlorate Migration and Potential Impacts

Update of the project numerical model continues using new information obtained from plume

characterization tasks, 1998 Comprehensive sampling, and City of Loma Linda water supply contingency (test boring) information. Updated projections of flow for various new and existing Bunker Hill Basin wells are being incorporated into the model forward simulation period.

4.0 Treatment Technology Applicability Review

This update presents recent developments in treatment technology research (section 4.1) and in toxicological studies (section 4.2) being done to establish an appropriate reference dose for perchlorate in drinking water.

4.1 Perchlorate Treatment Technology Update

This update presents the information we have gathered this quarter from technology company contacts, public agency contacts, universities, and current technical literature regarding ongoing research efforts to treat and remove perchlorate from drinking water.

Testing Sponsored by Lockheed Martin

Lockheed Martin is continuing to conduct research on different ion exchange resins using groundwater from the Sacramento, California area. The primary focus of this testing is to determine the performance of various resins in removing perchlorate from water. A second column test was started in January 1999 to further evaluate the performance of specialty resins that may be highly selective to perchlorate. This test will include an evaluation of the potential interference from other anions (e.g., sulfate) and an initial assessment of the potential to regenerate the resin.

Biological Treatment Testing Sponsored by Aerojet

Aerojet completed its pilot testing of the biological treatment process. The results of this testing demonstrated perchlorate removal levels below 4 ppb with nitrate removal levels below the detection limit. A full-scale facility was built and began operating in late December 1999. The treated water from this system is returned into the aquifer and has not been approved for direct use in a drinking water system. The facility is currently reducing perchlorate concentrations from 6500 ppb to non-detectable levels at a flow rate of 1400 gpm. Aerojet is in the process of conducting additional pilot tests in the San Gabriel Basin in conjunction with the Baldwin Park Operable Unit Steering Committee and the Main San Gabriel Watermaster.

AWWARF Perchlorate Research Contracts

The American Water Works Association Research Foundation has awarded work on seven perchlorate-related requests for proposals (RFPs). Three additional analytical projects remain unawarded. Attachment A includes a summary of the current AWWARF research projects for perchlorate, including the principal investigators and the status of their project.

Research Activities at the University of California at Riverside (UCR)

UCR has conducted both aerobic and anaerobic perchlorate treatment studies that reportedly reduced perchlorate levels to below the detection limit. In these laboratory studies, the anaerobic method proved to be more successful, but a readily available carbon source is required to fully implement this technique.

Research Activities at the University of Nevada at Las Vegas

Given the occurrence of perchlorate concentrations in Lake Mead, The University of Nevada at Las Vegas (UNLV) is currently focusing on ion exchange and biological removal of perchlorate. Their research had shown success in removing perchlorate from water using ion exchange. Further research is being conducted to investigate the feasibility of resin regeneration.

4.2 Perchlorate Regulation and the Provisional Action Level

A proposed oral benchmark for perchlorate of 0.0009 mg/kg-day was submitted by the EPA on December 31, 1998. The corresponding proposed perchlorate reference dose in drinking water is 32 ppb. This proposed reference dose is now being evaluated by an independent team of scientists with expertise in toxicology, pharmacology, and medical endocrinology.

The Research Triangle Institute (RTI) assembled a workshop on February 10th and 11th in San Bernardino, CA. to assist in completing the peer review a for perchlorate reference dose. RTI is an EPA contractor. Recent studies on perchlorate were reviewed including EPA's National Center for Environmental Assessment (NCEA) document "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization Based on Emerging Information." Several scientific issues related to uncertainty factors and the lowest observable adverse effect level (LOAEL) are being considered in the toxicological review of perchlorate.

The U.S. EPA expects to receive additional data from two other perchlorate related toxicological studies during the early part of 1999. The Peer Review Panel will be asked to comment on these new studies at another workshop anticipated to occur in the fall of 1999. As the process continues, the U.S. EPA will address comments made by the peer review panel, finalize the toxicological review, and is expected to establish a new RfD for perchlorate.

5.0 Water Supply Contingency Options

5.1 City of Riverside

The City of Riverside is currently able to blend perchlorate to levels far below the provisional action level.

5.2 City of Loma Linda

Lockheed Martin is working closely with the City of Loma Linda to install new production wells to avoid the perchlorate plume. The City of Loma Linda is reviewing a draft agreement that would allow Lockheed Martin to install up to three new production wells directly for the City. The first location, next to the existing Mountain View #1 well, has been suggested for installation of a deep aquifer production well. The California Department of Health Services is reviewing the permit application (well sanitary survey), and is expected to give its decision regarding the proposed location soon.

Meanwhile, Lockheed Martin continues to support the City of Loma Linda staff in developing blending plans to keep the perchlorate concentration below the provisional action level.

5.3 Victoria Farms

Lockheed Martin continues to negotiate with Victoria Farms to resolve issues relating to the draft (July 1997) Water Supply Contingency Agreement. Victoria Farms currently receives water from the City of San Bernardino under a temporary water supply agreement. Lockheed Martin is reimbursing Victoria Farms for the incremental cost of the imported water.

5.4 City of Redlands

The City of Redlands is avoiding perchlorate through the active management of their surface water and groundwater resources.

5.5 Mountain View Power Company (formerly Southern California Edison)

No perchlorate has been detected in the Mountain View Power Company wells.

5.6 Loma Linda University

During December, January, and February, Loma Linda University was performing maintenance on their reservoir. The City of Loma Linda provided water to the University. Thus, the University did not use their own supply wells during this period and no samples were taken. Sampling of the Loma Linda University wells will take place again when their wells come back into service.

6.0 Perchlorate Study Group

The Perchlorate Study Group (PSG) continues to provide financial support for ongoing toxicology research on perchlorate. As they are completed, the results of these studies are being forwarded to the Interagency Perchlorate Steering Committee, which includes members from the U.S. EPA and California EPA.

In cooperation with the PSG, the U.S. EPA, and the United States Air Force, Lockheed Martin is coordinating a multiple lab test of numerous chemical fertilizers for the presence of perchlorate in 1999.

7.0 References

The next quarterly update will be submitted on or about June 15, 1999. If you have any questions, please contact me at (818) 847-0197 or Mr. Tom Blackman at (818) 847-0791.

Sincerely,

Carol Yuge
Deputy Director
Burbank Program Office

cc: See attached distribution list

Attachment A: 1998 AWWARF Awarded RFPs Update

Attachment A: AWWARF Awarded Research Contracts for Perchlorate

Project Title (RFP NO.) / Principal Investigator	Current Project Status
National Assessment of Perchlorate Contamination Occurrence (2508) / Metropolitan Water District of Southern California	Hsiao-Chiu Wang and her team devoted the first quarter to contacting perchlorate contacts and designing a ranking system to perform a risk assessment for the project.
Application of Bioreactor Sytems to Low-Concentration Perchlorate-Contaminated Water (2530) / Northwestern University	Bruce Rittman and his team have not received a signed contract from the AWWARF and have no progress to report.
Treatability of Perchlorate-Containing Waters by Reverse Osmosis and Nanofiltration (2531) / The University of Colorado at Boulder	Gary Amy and his team provided the following approach to their project: "We are performing an evaluation of rejection of perchlorate by reverse osmosis and nanofiltration membranes. A basic premise of our research is that, through electrostatic exclusion by charged membranes, significant rejection of the perchlorate anion can be realized by higher molecular weight cutoff membranes, beyond simply reverse osmosis. While our project is just commencing, we are demonstrating the approach in related work focusing on arsenate rejection".
The Treatability of Perchlorate in Groundwater Using Ion Exchange Technology (2532) / The University of Houston	Dennis Clifford and his team have not received a signed contract from the AWWARF and have no progress to report.
Removal of Perchlorate and Bromate in Conventional Ozone/GAC Systems (2535) / The University of Illinois	Vernon Snoeyink and his team have just begun their project and have no progress to report.
Investigation of Methods for Perchlorate Destruction in Aqueous Waste Streams (2536) / Pennsylvania State University	Fred Cannon and his team devoted the first quarter to creating a reference and contact list on chlorate/perchlorate bioremediation. Information and results will not be available to the public until the project is finalized.
Application of Bioreactor Systems to Low-Concentration Perchlorate Contaminated Water (2577) / Pennsylvania State University	Bruce Logan and his team devoted the first quarter to creating a reference and contact list on chlorate/perchlorate bioremediation. Information and results will not be available to the public until the project is finalized.
Survey the Performance of the California DHS (Ion Chromatography) Analytical Protocol (2533)	Not yet selected for funding
Short-Term Perchlorate Laboratory Issues (2534)	Not yet selected for funding
Investigation of Methods for Perchlorate Destruction in Aqueous Waste Streams (2578)	Awaiting Funding

Mr. Gerard J. Thibeault
March 17, 1999

cc: Kalyanpur Baliga, Department of Health Services (San Bernardino)
Tom Bartol, USAF, Norton Air Force Base
Dodie Farmer, Victoria Farms Mutual Water Company
Wesley Danskin, United States Geological Society
Gary Forth, City of Loma Linda
Douglas Headrick, San Bernardino Valley Water Conservation District
Mike Huffstutler, City of Redlands
Ross Lewis, Gage Canal Company
Kevin Mayer, U.S. EPA, Region IX
Steve Mains, Western Municipal Water District
Morris Matson, Loma Linda University
Eugene McMeans, Riverside Highland Water Company
Zahra Panahi, City of Riverside
Bob Reiter, San Bernardino Valley Municipal Water District
Toby Roy, Department of Health Services (San Diego)
Alain Sharp, Earth Technology Corporation
Joseph Stejskal, City of San Bernardino
Dieter Wirtzfeld, City of Riverside